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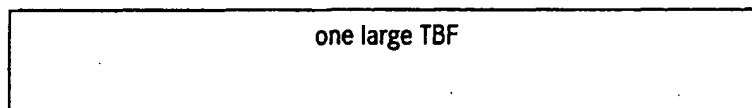
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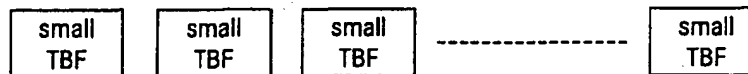
(54) **Transmission quality determination**

(57) In order to determine and/or improve the Quality Of Service (QOS) of a communication network, for example a GPRS network, the number of Temporary Block Flows (TBF) which is needed to transmit a certain

amount of user data, is counted. Depending on this number of TBF's and the transmitted amount of user data the transmission quality of the communication network is calculated, for example as the ratio of the TBF-number to the amount of data.



One large TBF to carry user data, efficient use of network capacity



Many TBFs used, each TBF requires time to set up / release

FIG 1

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Description

Technical Field

[0001] The invention relates to a process and a device for determination of a transmission quality of a communication network for data transmission, where the data is divided into one datablock or a plurality of datablocks.

Background art

[0002] It is known to determine the transmission Quality or the Quality Of Service (QOS) of a communication network. This is done by measuring one or more parameters which are believed to be representative of the QOS. Such parameters include for example the speech quality or the throughput rate etc.

[0003] In some communication networks, i.e. in GPRS (general packet radio service) networks, which are based on transmission of packets of user data, the user data is subdivided into smaller amounts and transmitted in blocks, when a large amount of data has to be transmitted. These blocks are called Temporary Block Flow (TBF). However, these TBF's have to be set up before use as well as released afterwards which lowers the throughput due to the time needed for TBF set up and TBF release.

[0004] In known communication systems there is no process or equipment available which enables to determine the influence of TBF set up/release on the QOS of the network during user data transfer.

Summary of the Invention

[0005] It is therefore an object of the present invention to provide a process of the aforementioned kind which enables the determination of the transmission quality of a communication network depending on the TBF handling.

[0006] This object can be achieved with the process defined by Claim 1. According to the invention the process for determination of the transmission quality of a communication network for data transmission, where the data is divided into one or more datablocks, involves the determination of the number of datablocks which are needed for the transmission of a certain amount of data. Depending on the number of datablocks and the transmitted amount of data the transmission quality is computed. A simple and therefore preferred way of computing the transmission quality is to build the ratio of the number of datablocks to the transmitted amount of data.

[0007] By changing the length of a TBF the number of TBF's needed to transmit the same amount of user data can be varied. The inventive process therefore enables the network operator to determine the QOS depending on the TBF length and hence to choose a TBF length, which best fits the given network conditions. By tuning the network in varying the TBF length the opera-

tor can improve the transmission efficiency which for a given network capacity means, that the network can carry more subscriber data.

[0008] According to the invention the device for determination of the transmission quality of a communication network for data transmission, where the data is divided into one or more datablocks, comprises means for the determination of the number of datablocks which are needed for the transmission of a certain amount of data. Furthermore it comprises means for calculating the transmission quality depending on the number of datablocks and the transmitted amount of data. It preferably comprises means for calculating the transmission quality as a ratio of the number of datablocks to the transmitted amount of data.

[0009] From the following detailed description and from all the claims as a whole it will be clear to a person skilled in the art, that there exist more advantageous embodiments and combinations of characteristics of the invention.

Ways of carrying out the Invention

[0010] The drawings used for illustration of the examples show:

Fig. 1 A schematic diagram of plurality of small Temporary Block Flows (TBF) compared to a large TBF and

Fig. 2 an extract from a transmission protocol.

[0011] GPRS networks are based on transmission of packets of user data. When the user has a large amount of data to be transmitted, the GPRS network will subdivide the user data into smaller amounts and attempt to transmit them in blocks. These blocks are called Temporary Block Flow (TBF).

[0012] Figure 1 shows one large TBF to carry user data, which allows an efficient use of the network capacity. Figure 1 furthermore shows many smaller TBF's to transmit the same amount of user data where each TBF requires time to set up / release and therefore lowers the data throughput rate.

[0013] The TBF has to be set up before use i.e. before it can carry user data, and has to be released after use. The set up / release of TBF requires network signalling and time. Therefore, the time needed to set up/release a TBF represents an overhead in network signalling. During these signalling times, user data is not transmitted. In contrast, if one long TBF is used, little time is "wasted" in set up / release of TBFs.

[0014] It follows, therefore, that if the network subscriber has a large amount of data to transmit, and the network sets up / releases a large number of TBFs for this transfer, then the data throughput will be lowered due to the time taken up for the TBF set up / release process.

[0015] It is not known that any available process / equipment can measure the amount / number of TBFs used during subscriber data transfer. Further, it is not known that there are any explicit signalling or indications to mark the release of a TBF, so the detection of a TBF release is not obvious.

[0016] According to the invention the system measures the amount / number of TBFs used in any user data transfer.

[0017] In a preferred embodiment of the invention this is done by for example, searching for and counting the number of times a TBF is set up / released.

[0018] Figure 2 shows an extract from a transmission protocol. As the event of a TBF release is not explicitly signalled in a GPRS network, the system will deduce the occurrence of this event by, for example, searching for four "packet control acknowledgment" messages which occur in rapid succession in the transmission protocol. In figure 2, four packet control acknowledgment 08:37:37:780 to 08:37:37:790 can be recognized.

[0019] In cases where these four messages are not sent, the system will detect the release of a TBF by the expiry of a timer T3912 in a subscriber handy or any other communication device such as a handy with test equipment features. Once this timer counts down to zero, the TBF will be released. The said subscriber handy or any other device forms part of the system, and there is communication between the system control part and the handy to detect the timer expiry.

[0020] It may happen in future, that additional signalling could be introduced to indicate explicitly the release of a TBF. In which case, the system can be easily extended to make use of the new indications.

[0021] The system will report the number of TBFs used to carry a specific amount of subscriber data, and hence calculate the "efficiency of the transmission". The less TBFs are used, the more efficient is the transmission.

[0022] In knowing whether the transmission link is efficient or not, the network operator can, for example, change the network software and tune the network. After tuning, the measurement can be repeated to record what improvements, if any, has resulted.

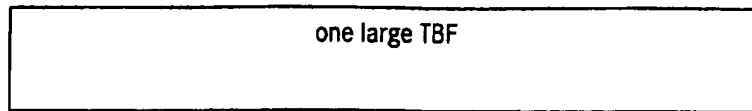
[0023] For any given network capacity, the more efficient the network transmission, the more subscriber data can the network carry.

Claims

1. Process for determination of a transmission quality of a communication network for data transmission, where the data is divided into one datablock or a plurality of datablocks, **characterized in that** a number of datablocks, which are needed for transmission of a certain amount of data, is determined and the transmission quality is computed depending on the number of datablocks and the transmitted

amount of data, particularly as a ratio of the number of datablocks to the transmitted amount of data.

2. Process according to claim 1, **characterized in that** the data is transmitted based on a packet transmission technology where the data is transmitted within a plurality of data packets and where each datablock comprises at least one data packet.
3. Process according to claim 1 or 2, **characterized in that** the transmission quality of a cellular mobile radio network, particularly a GPRS (general packet radio service) network, is determined.
4. Process according to any one of claims 1 to 3, **characterized in that** the number of datablocks is determined by counting a occurrence of a particular event or a particular series of events.
5. Process according to claim 4, **characterized in that** an event "set up datablock" or an event "release datablock" is counted.
6. Process according to claim 5, **characterized in that** the occurrence of the event "release datablock" is recognized by detecting in a transmission protocol of the data transmission a certain number of a particular message, particularly the message "packet control acknowledgment", in rapid succession.
7. Process according to claim 5, **characterized in that** the occurrence of the event "release datablock" is recognized by detecting an expiry of a timer, particularly the timer T3912 of a mobile radio device in a GPRS radio network.
8. Process according to claim 5, **characterized in that** the occurrence of the events "set up datablock" or "release datablock" is counted by counting a message in a transmission protocol of the data transmission being reserved for the events "set up datablock" or "release datablock" respectively.
9. Device for determination of a transmission quality of a communication network for data transmission, where the data is divided into one datablock or a plurality of datablocks, **characterized in that** the device comprises means for determination of a number of datablocks needed for transmission of a certain amount of data and means for calculating the transmission quality depending on the number of datablocks and the transmitted amount of data, particularly as a ratio of the number of datablocks to the transmitted amount of data.



One large TBF to carry user data, efficient use of network capacity



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FIG 1

Live View		Record Data
GSM900		08:37:37.480 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_CONTROL_ACKNOWLEDGMENT_8BIT
BSC: 1008		08:37:37.480 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_CONTROL_ACKNOWLEDGMENT_8BIT
Channel: 1008		08:37:37.480 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_CONTROL_ACKNOWLEDGMENT_8BIT
LAC: 1008		08:37:37.490 NetworkType: P-GSM900; Direction: Downlink; Message: PACKET_DOWNLINK_ASSIGNMENT
MCC: 228		08:37:37.570 Delay: 891 ms, Messages Transferred: 1; Packet Loss: 0
MNC: 100		08:37:37.620 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_DOWNLINK_ACK_NACK
NetworkType: P-GSM900		08:37:37.650 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_DOWNLINK_ACK_NACK
RAC: 100		08:37:37.760 NetworkType: P-GSM900; Direction: Downlink; Message: PACKET_UPLINK_ACK_NACK
Measurement Task START: Motion PNG		08:37:37.780 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_CONTROL_ACKNOWLEDGMENT_8BIT
Delay: 891 ms		08:37:37.780 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_CONTROL_ACKNOWLEDGMENT_8BIT
Messages Transferred: 1		08:37:37.780 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_CONTROL_ACKNOWLEDGMENT_8BIT
Packet Loss: 0		08:37:37.790 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_CONTROL_ACKNOWLEDGMENT_8BIT
Measurement Task STOP: Motion PNG		08:37:37.810 NetworkType: P-GSM900; Direction: Uplink; Message: PACKET_DOWNLINK_ACK_NACK
Delay: 891 ms		
Messages Transferred: 1		
Packet Loss: 0		
No Selection		

Four packet control acknowledgment 08:37:37:780 to 08:37:37:790

FIG 2



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EUROPEAN SEARCH REPORT

Application Number
EP 01 81 0583

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 691 314 A (BERGINS LEWIS A ET AL) 1 September 1987 (1987-09-01) * abstract *	1,9	H04L1/20
Y	* column 4, line 9 - line 50 * * column 4, line 65 - column 5, line 4 * * column 5, line 63 - column 7, line 5 *	2-8	
Y	EP 1 006 695 A (NOKIA MOBILE PHONES LTD) 7 June 2000 (2000-06-07) * page 3, line 38 - line 44 * * page 4, line 47 - line 54 * * page 5, line 25 - line 56 * * page 6, line 48 - line 51 * * page 9, line 16 - line 44 *	2-8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H04L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 November 2001	Examiner Toumpoulidis, T
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 81 0583

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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21-11-2001

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4691314	A	01-09-1987	NONE	
EP 1006695	A	07-06-2000	FI 982577 A	28-05-2000
			AU 1563300 A	19-06-2000
			BR 9915676 A	25-09-2001
			EP 1006695 A1	07-06-2000
			WO 0033498 A2	08-06-2000
			JP 2000174820 A	23-06-2000

EPO FORM P0456

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82